

BAB VI

PERHITUNGAN BALOK B3

6.1 Properties Balok B3

Data - data : $b := 250 \text{ mm}$ Tulangan utama D19 mm
 $h := 450 \text{ mm}$
 $d := h - (40 + 10 + 0.5 \cdot 19) = 390.5 \text{ mm}$
 $d_{aksen} := h - d = 59.5 \text{ mm}$
 $f_c := 20.75 \text{ Mpa}$ $\beta := 0.85$
 $f_y := 390 \text{ Mpa}$

$$\rho_b := 0.85 \cdot \beta \cdot \frac{f_c}{f_y} \cdot \left(\frac{600}{600 + f_y} \right) = 0.02$$

$$\rho_{max} := 0.75 \rho_b = 0.017$$

$$\rho_{min} := \frac{1.4}{f_y} = 0.0036$$

$$m := \frac{f_y}{0.85 \cdot f_c} = 22.11$$

Dari output ETABS didapat :

Mutump := 100.3799 kNm

Mulap := 91.3058 kNm

6.2 Perhitungan Tulangan Lentur Tumpuan

ambil $\delta := 0.4$

$$M_n := \frac{Mutump \cdot 10^6}{0.8} = 125474875 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta) M_n}{b \cdot d^2} = 1.975 \text{ N/mm}^2$$

$$(\rho - \rho_{aksen}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}} \right)}{m} = 0.0054$$

$$\rho_{aksen} := \frac{\delta \cdot M_n}{f_y \cdot (d - d_{aksen}) \cdot b \cdot d} = 0.004$$

$$\rho := 0.0054 + 0.004 = 0.0094 > \rho_{min} = 0.0036$$

$$A_{sperlu} := \rho \cdot b \cdot d = 917.68 \text{ mm}^2$$

$$A_s := 0.785 \cdot 19^2 \cdot 6 = 1700.31 \text{ mm}^2$$

$$s1 := \frac{(250 - 80 - 20 - 4 \cdot 19)}{4 - 1} = 25 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK!!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 388.8 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 19^2 \cdot 4 = 1133.54 \text{ mm}^2$$

pasang tul tarik 6D19 dan tulangan tekan 4D19

6.3 Perhitungan Tulangan Lentur Lapangan

$$\text{ambil } \delta := 0.4$$

$$M_n := \frac{M_{\text{lap}} \cdot 10^6}{0.8} = 114132250 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta) M_n}{b \cdot d^2} = 1.8 \text{ N/mm}^2$$

$$(\rho - \rho_{\text{aksen}}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}}\right)}{m} = 0.0049$$

$$\rho_{\text{aksen}} := \frac{\delta \cdot M_n}{f_y \cdot (d - d_{\text{aksen}}) \cdot b \cdot d} = 0.0036$$

$$\rho := 0.0049 + 0.0036 = 0.0085 \quad \blacksquare > \blacksquare \quad \rho_{\text{min}} = 0.0036$$

$$A_{s_{\text{perlu}}} := \rho \cdot b \cdot d = 829.81 \text{ mm}^2$$

$$A_s := 0.785 \cdot 19^2 \cdot 6 = 1700.31 \text{ mm}^2$$

$$s1 := \frac{(250 - 80 - 20 - 4 \cdot 19)}{4 - 1} = 25 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK!!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 353.65 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 19^2 \cdot 4 = 1133.54 \text{ mm}^2$$

pasang tul tarik 6D19 dan tulangan tekan 4D19

6.4 Perhitungan Tulangan Geser Balok

$$V_c := \frac{\sqrt{f_c} \cdot b \cdot d}{6} = 74117.17 \text{ N}$$

$$V_u := 68490 \text{ N}$$

$$V_c = 74117.17 \text{ N}$$

$$V_s := \frac{V_u}{0.75} - V_c = 17202.83 \text{ N} \quad \text{Perlu tulangan minimum !!}$$

$$V_{s_{\text{min}}} := \frac{b \cdot d}{3} = 32541.67 \text{ N}$$

Bila dipasang tulangan $\Phi 10$ sebagai sengkang, $A_v := 2 \cdot 0.785 \cdot 10^2 = 157 \text{ mm}^2$

$f_y := 240 \text{ Mpa}$

$$s := \frac{A_v \cdot f_y \cdot d}{V_{smin}} = 452.16 \text{ mm}$$

sehingga dipakai tulangan geser tumpuan $\phi 10 - 150$ dan lapangan $\phi 10 - 200$